

**APPLICATION FOR UNITED STATES LETTERS PATENT**

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TITLE: Wire Cleaning Brush With Renewable Bristles

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INVENTOR: Joseph Alfred Beary, a citizen of the United States and a resident of Port  
Hadlock, Washington

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## BACKGROUND OF THE INVENTION

### A. Field of the Invention

This invention relates to cleaning implements and devices and more particularly to a cleaning implement comprising a wire brush with renewable bristles. It is particularly useful for removing dried up oily dirt from firearms, but is also applicable for use on auto parts, aircraft parts, fishing reels, or any other device that has areas that collect dirt and/or dried up oil and must be manually cleaned. It is also particularly suited for use in manually cleaning small parts of all kinds of equipment. It is very useful for removing surface rust from delicate blued surfaces of firearms when used in conjunction with some rust preventive oil to loosen the rust. The fine stainless steel bristles of the preferred embodiment will not harm the delicate bluing on a firearm if used gently.

### B. Description of Related Art

The present invention was motivated by the inventor's dissatisfaction with existing small wire cleaning brushes, which quickly become deformed from the pressure applied when using them to scrub parts, rendering them nearly useless, and causing them to be disposed of. Patents of interest in this area include U.S. Patent Nos. 4,509,223; 5,337,505, and 1,776,443. The art has lacked a wire brush with replaceable bristles, hence, after the brushes become deformed the brush is not reusable any more. It was also desired to have a scraper for removing heavy dried oil. The art has lacked a combination scraper and wire brush, with renewable bristles, particularly one of a suitable small size for the cleaning of firearms, or other small mechanisms that accumulate dried oily residue and need to be manually cleaned. The present invention meets that need.

## SUMMARY OF THE INVENTION

A cleaning implement with renewable bristles is provided, comprising an elongate, hollow tube having a first end and a second end, a bundle of bristles inserted into the tube and having a portion extending beyond the first end of the tube, and a crimp in the first end of the tube. The bristles are retained in place within the tube solely by the crimp of the first end of the tube to squeeze the tube against the bundle of bristles. The portion of the bundle of bristles projecting beyond the first end is trimmed to form a brush for the cleaning implement. An uncrimping of the first end of the tube allows the bundle of bristles to be partially withdrawn from the tube to thereby provide a new portion of the bundle of bristles and thereby renew the bristles for the brush.

In one possible embodiment, the second end of the tube is cut at an angle to thereby form a scraping implement. In an alternative embodiment the second end of the tube comprises a threaded adapter for threadably and removably receiving a tool, such as a brush of various types, cutting or scraping implements, etc.

By having renewable bristles inside a tubular structure, the invention allows the operator to quickly pull out some new wire bristles, cut off the deformed ends, and have new bristles to work with. This is much more economical than disposing of a worn out brush and handle, and saves valuable resources, and cuts down on refuse going into a landfill.

By forming a scraper at the opposite end of the wire brush in the preferred embodiment, a tool is provided with multiple uses for cleaning, which is much more convenient for the operator than having two separate implements; a separate wire brush, and separate scraper. This saves the operator time by not having to switch between separate implements. One merely

reverses the holding of the tool end for end, and brings either the brush end or the scraper end into play with one hand.

Preferably, the cleaning implement is formed to a size that is suitable for ease of grasping in the human hand, between one's thumb and index finger, and is particularly suitable for  
5 cleaning small recessed areas that accumulate dried up oily dirt mixtures.

As will be explained in conjunction with the drawings, the inventive cleaning implement can take on a number of different embodiments, depending on the particular cleaning requirements that may be encountered.

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FOOTNOTES

## BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a side view of a brass tube, sawn to length for the body of the preferred embodiment of the present cleaning implement.

Fig. 2 is a right hand end view of the tube of Fig. 1.

Fig. 3 is a left hand end view of the tube of Fig. 1.

Fig. 4 is a side view of the tube of Fig. 1 showing the angled cut to form the scaper end of the cleaning implement.

Fig. 5 is a top view of the tube of Fig. 4.

Fig. 6 is an enlarged view of the scraper end of the implement of Fig. 5.

Fig. 7 shows an alternative embodiment of the scraper end Fig. 6 with the end being turned down, providing more flexibility to enter into small crevices to scrape out debris.

Fig. 8 shows how the bristles of a wire brush become deformed from downward pressure being applied, and side to side motion of the bristles against a surface.

Fig. 9 is a side view of the completed preferred embodiment of the cleaning implement, showing bristles projecting from one end in a severely deformed and worn out condition.

Fig. 10 shows the operation of pulling out replacement bristles from the tube body in the direction of arrows, in preparation for cutting off the worn out portion.

Fig. 11 shows scraper end of the device of Fig. 9.

Fig. 12 is a right hand end view of corner of Fig. 11.

Fig. 13 shows a side view of the scraper end of the implement of Fig. 9 being used to clean the slotted head portion of a screw.

Fig. 14 shows a top view of the scraper end 4B of the preferred embodiment being moved left to right in a screw slot.

Fig. 15 shows a scraper end scraping a curved surface.

Fig. 16 shows another embodiment of the present invention with the bristle end formed at  
5 between 80 to 90 degrees perpendicular to the tube body.

Fig. 17 shows a coil of bristle wire which form the long bristles that fit inside tube body.

Fig. 17A shows the coil partially squeezed together at the topmost portion in preparation for insertion into the tube body.

Fig. 18 shows the tightly squeezed coil end of Fig. 17A being inserted into the tube end.

Fig. 19 shows the coil inserted into the tube body forming a loop.

Fig. 20 shows the wire coil of Fig. 17 fully inserted in to the tube, with the loop severed along a line forming uneven end bristles.

Fig. 21 is a side view of a completed form of the preferred embodiment of the present invention.

Fig. 22 is a top view of the completed form of the preferred embodiment of the present invention.

Fig. 23 shows a side elevation cutaway view of the tube, with the wire loop fully inserted in a completed form of the preferred embodiment.

Fig. 24 is a top cut away view of a completed form of the preferred embodiment, showing  
20 the wire coil in it's final position inside the tube body.

Fig. 24A is an enlarged top view of the completed brush end of the preferred embodiment, showing a checkerboard crimping of brass tube end.

Fig. 25 is a side elevation of the brush end of the preferred embodiment, showing details of the crimped brass in a checkerboard pattern.

Fig. 26 shows hand pliers being used to uncrimp the brass in preparation for pulling out the bristles to renew the bristles.

Fig. 27 shows hand pliers being used to re-crimp the brass tube after pulling out an additional length of bristles for renewal.

Fig. 28 is an enlarged view of the tube and Fig. 3, showing the inner wall of the tube body left in an as-sawn condition.

Fig. 29 is a side view of a second embodiment of a scraper end, formed from square tubing.

Fig. 30 shows a section of square tubing with the inner wall left in an as-sawn, rough edged condition, with the outer edge only being deburred.

Fig. 31 is a top view of a second embodiment made from square tubing, showing the scraper angle edges.

Fig. 32 is a side elevation of a third embodiment in which the bristles are bent perpendicular to the tube body.

Fig. 33 is a bottom view of the third embodiment showing the tips of bristles and finger grooves.

Fig. 34 shows a fourth embodiment with a threaded adapter attached to the end of the tube instead of forming a scraper end, as in the first through third embodiments.

Fig. 35 shows a common circular twisted wire cleaning brush of a type used for cleaning firearm bores, which screws into a threaded adapter such as that shown in Fig. 34.

Fig. 36 is a completed side view of the fourth embodiment, with a renewable bristle brush at one end, and a threaded adapter at the opposite end.

Fig. 37 is an end view of the threaded adapter as shown in Figs. 34, and 36.

5 Fig. 38 shows an alternate method of forming the bristle ends at an angle adding to the versatility of the brush end, allowing a broader cleaning area.

Fig. 39 shows two tubes being filled with bristle wires, the wires being at a location between the tubes.

Fig. 40 depicts a fifth embodiment incorporating the straight bristle end of the preferred embodiment with the angled bristle end of the third alternate embodiment.

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## DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

In accordance with one preferred embodiment of the invention, a combination wire brush and scraper implement is provided in which the implement has renewable bristles. Several different preferred and alternative embodiments will be described in detail in the following discussion.

Referring to Figs. 1-3, the main body of the preferred embodiment is formed from a cylindrical hollow tube, such as a brass tubing of 5/32" outside diameter, with a wall thickness of .014", and sawcut to 6" in length. The formed tube 1 has a first end 1A and a second end 1B. The end 1B has a deburred outer edge 3A and an inner edge 3B left in a rough sawn condition. The tube end 1A is further saw cut at an angle as shown in Fig. 4, forming the scraper end of the device, represented by points 4A, and 4B. Fig. 5 shows a top view of the scraper end, depicting an oval shaped area 5A, with scraper angle points 4A, and 4B, and scraper side edges 6A, and 6B, which also can be employed for scraping out dirt on larger flat surfaces. The scraper end 4B is shown in use in Figures 11 through 15. The scraper end can clean in tight spaces such as screw slots (Figures 13, 14), in corners (Figures 11, 12) and along curved surfaces 15 (Figure 15).

The preferred embodiment of the present invention has the tube body 1 filled with bristle wire as depicted in Figures 10, 20, 22, 23, and 24. The bristle wire is formed to the correct length by winding fine stainless steel spring wire into a coil form as depicted in Fig. 17, the number of windings being calculated to give an approximately 50% fill of the inside diameter of the tube 1 when it is doubled over and inserted as shown in Figure 19. A distinct advantage of winding a coil of wire is that it is much more economical to form the bristle wires, as opposed to the more conventional method of using a multiplicity of individual spools of wire to feed into a

tube to form the bristles. Coil 17 is secured from unraveling itself by the use of soft steel tie wires 17A and 17B at opposite sides of the coil.

Wire coil 17 is folded tightly at the tie wire point 17A, and inserted into tube 1 of Figure 1 at end 1B, in the direction of arrow 18B in Fig. 18. Coil 17 is further inserted into tube 1 until tie wire end 17A reaches point 20B in Figure 20. The circumference of coil 17 is calculated to be of the right length to fill the tube 1, such that when the coil is inserted into tube 1, in the direction of arrow 18B, and folded back upon itself, tie wire twisted end 17A is stopped at line 20B, Fig. 20, with sufficient wire protruding to form a loop 19C. Loop 19C is severed at line 19B, and tie wire 17B is discarded, leaving cut off, uneven bristles, 20D as shown in Fig. 20. Either tied end of coil 17 may first be inserted.

It has also been found that coil 17 may be wound to twice the circumference necessary for a single set of brush bristles, and one of each of the tie wire ends 17A and 17B may be inserted in each end 1B of two tubes 1, in the direction of arrows 39A and 39B as depicted in Fig. 39, whereupon the center of the coil at line 17E and 17 F is severed, forming two sets of uneven cutoff bristles, as depicted at Fig. 20 at 20D. This significantly improves the quantity of brush bristles produced from a single wire-winding device.

It will also be appreciated that a coil of bristle wires may be wound to any practical circumference desired, spot welded or soldered at one point (e.g. at 17A) and severed at one side of a spot weld or solder joint, and stretched out or unraveled into straight lengths to create a continuous line of wires which can then be spotwelded, or soldered, and then severed to convenient length to fill the tube 1 with bristles. An alternate method of securing the coil from unraveling is the use of solder at the opposite extremes of coils, in place of the twisted soft, steel tie wire. Of course, other methods could be used.

Tube 1, with uneven severed bristles 20D is next squeezed down in a crimping device which imparts a checkerboard pattern to the top and bottom surfaces 25A and 25B, as depicted in a top view in Fig. 24-A, and in a side view at Fig. 25. The wrinkled checkerboard surface produced by the crimping device shown in Fig. 25 imparts a broader surface area for holding the  
5 bristles. The rough cut inside wall edge 3B left on the inner wall of the tube 1 as shown at Fig. 3, and in an enlarged view in Fig. 28, serves to stop the bristles from pushing back up into the tube 1 when the brush is used in a vertical position, such as is depicted in Fig. 8.

The uneven protruding bristle ends 20D are sheared at a convenient length as depicted in Fig. 20, at line 20C, and shown in a finished, even condition in Figs. 21 through 25. A fine  
10 grinding wheel is used to further smooth any unevenness and deburr the bristle ends 20A. A completed view of the preferred embodiment is depicted in side and top views at Figs. 21 and 22, respectively.

In use, the wire bristle end 20A of the present invention may eventually become severely deformed as indicated at 8B in Figs. 8, 9, and 10. The operator may then proceed to restore the deformed bristle end to like new condition by gently uncrimping the bristles at opposite sides  
15 24A and 24B of the crimped end of the tube 1 with a pair of pliers 26. The operator then pulls out a sufficient length of new bristle wire from the tube 1 (distance d in Figure 10), in the direction of arrow 10B, shown in Fig. 10. The operator then gently re-crimps the tube end surfaces 25A and 25B with pliers 26. The operator then shears off bristles as depicted at line  
20 10C, Fig. 10. Deburring is done on a fine grinding wheel, and an as-manufactured condition bristle end is the result. The bristles are renewable many times, and may be cut short or long to the operator's preference, to suit the particular cleaning job at hand.

A second embodiment of the present invention substitutes the use of square or rectangular cross-section brass tubing 29, as depicted in section in Fig. 30, and side and top views in Figs. 29 and 31, respectively. This embodiment is in all respects similar to the preferred embodiment with the exception of the scraper end, which is square to the tube body 29 at its bristle end 30A. The scraping surface has a top edge 31A and a bottom edge 31B, with straight sides 31C and 31D.

A third embodiment is depicted in Figs. 32 and 33. This embodiment uses either round, or square brass tubing for the tube body, in all respects similar to the preferred embodiment, with the bristles 20A bent perpendicular to the axis of the tube body 1 at between 80-90 degrees. This allows the brush bristles to fit in tight recesses as depicted in Fig. 16.

A grasping groove 33A and 33B for the thumb and forefinger of the operator's hand is incorporated into the third embodiment, and also serves to further encapsulate the bristles wire to minimize swaying of the bristles when moved in side to side fashion as in Fig. 8, at arrows 8C and 8D.

A fourth embodiment is depicted in Figs. 34-37, which substitutes a permanently attached threaded adapter 37 in place of the formed scraper of the preferred embodiment. The threaded adapter 37 has a recessed area 37A which is formed to a size to fit the tube end 1A, and is soft soldered in place. Adapter 37 is threaded at aperture 37b for the threaded end shank 35A, of a wound twisted wire cleaning brush or any other suitable tool, as depicted in Fig. 35.

A fifth embodiment of the present invention incorporates the straight bristle brush element of the preferred embodiment, combined with the angled bristle brush element of the third embodiment, as depicted in Fig. 40. Both brush ends 20A of the fifth embodiment incorporate renewable bristle elements 17, which are inserted into tube ends 1A, and 1B,

respectively, with two separate coils 17. The coils are inserted until the tie wire ends 17B meets at the center of the tube 1, as depicted at Fig. 40, line 40A.

In another aspect, a method for forming a brush with removeable bristles has been described above in conjunction with the drawing. The method comprises the steps of providing a hollow tube having a first end, winding metal wire into a coil; and inserting the coil of wire into the first end of the hollow tube. The coil is further inserted into the tube until a substantial portion of the coil of wire has been inserted into the tube and leaving a portion of the coil protruding beyond the first end of the tube. The metal wire forming the coil is severed at a location distal from the first end of the tube to thereby leave strands of the metal wire projecting beyond the first end of the tube to thereby form bristles for a brush. The method continues with the step of forming a crimp in the hollow tube in the vicinity of the first end of the tube to thereby squeeze the tube against the coil of metal wire inside the tube and thereby substantially prevent the coil of metal wire inside the tube from moving relative to the tube. An uncrimping of the crimp allows the coil of metal wire to be partially withdrawn from said first end of the tube to thereby renew the bristles of the brush.

The circumference of the coil of wire, C, when it is placed in a circular configuration is preferably at least twice the length of the tube 1 so as to insure an adequate amount of bristle material in the tube and enough bristle material projecting beyond the end of the tube when the coil is inserted into the tube.

Various modifications can be made to the disclosed embodiments without departure from the invention, as defined by the appended claims.